FERC Pre-Filing Review
Draft Resource Report 7 – Soils
AES Sparrows Point LNG Terminal & Mid-Atlantic Express Pipeline

Submitted: September 2006

SUMMARY OF REQUIRED FERC REPORT INFORMATION		
TOPIC	**FERC Reference**	**Report Reference or Not Applicable**
1. Identify, describe, and group by milepost the soils affected by the proposed pipeline and aboveground facilities. • List the soil associations by milepost and describe their characteristics.	§ 380.12(I)(1)	Section 7.3.1 Table 7.3-1
2. For aboveground facilities that would occupy sites over 5 acres, determine the acreage of prime farmland soils that would be affected by construction and operation. (§ 380.12(I)(2)) • List the soil series, describe their characteristics and percentages within the site. • Indicate the onsite percentage of each series that would be permanently affected. • Indicate which series are considered "prime or unique farmland".	§ 380.12(I)(2)	Section 7.3.2
3. Describe by milepost potential impacts on soils.	§380.12(I)(3,4)	Section 7.4 Table 7.3-1
4. Identify proposed mitigation to minimize impact on soils and compare with the staff's Upland Erosion Control, Revegetation, and Maintenance Plan. • Identify any measures of the Plan that are deemed unnecessary, technically infeasible, or unsuitable and describe alternative measures that will ensure an equal or greater level of protection.	§ 380.12(I)(5)	Section 7.5 Appendix 2A and 2B to Resource Report 2

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

7. SOILS

7.1 Introduction

AES Sparrows Point LNG, LLC proposes to construct, own, and operate a new liquefied natural gas (LNG) import, storage, and regasification terminal (LNG Terminal) at the Sparrows Point Industrial Complex situated on the Sparrows Point peninsula east of the Port of Baltimore in Maryland. LNG will be delivered to the Sparrows Point LNG Terminal via ship, offloaded from the ship to shoreside storage tanks, regasified on the Sparrows Point LNG Terminal site (Terminal Site), and transported to consumers via pipeline. The LNG Terminal will have a regasification capacity of 1.5 billion cubic standard feet of natural gas per day (bcsfd), with potential to expand to 2.25 bcsfd. Regasified natural gas will be delivered to markets in the Mid-Atlantic Region and northern portions of the South Atlantic Region through the Mid-Atlantic Express Pipeline (Pipeline), which is an approximately 87-mile, 30-inch outside diameter natural gas pipeline to be constructed and operated by Mid-Atlantic Express, LLC. The Pipeline will extend from the LNG Terminal to interconnections with existing natural gas pipeline systems near Eagle, Pennsylvania. Together the Sparrows Point LNG Terminal and Mid-Atlantic Express Pipeline projects are referred to as the Sparrows Point Project or Project. Both AES Sparrows Point LNG, LLC and Mid-Atlantic Express, LLC (hereinafter collectively referred to as AES) are subsidiaries of The AES Corporation.

AES is considering the possibility of building a combined cycle cogeneration power plant (Power Plant) on the Terminal Site. The Power Plant will be configured with one F-Class combustion gas turbine, one steam turbine, and associated auxiliaries. The Power Plant will operate only on natural gas, and will produce approximately 300 MW of clean electric power within an area of high energy demand. The Power Plant will be connected to the local utility electric system via an overhead transmission line. For purposes of this Resource Report, the Power Plant will be considered part of the Project. The Power Plant is addressed more fully in Section 1.10 of Resource Report 1.

The Project footprint is located in the counties of Baltimore, Harford, and Cecil in Maryland and the counties of Lancaster and Chester in Pennsylvania. The Terminal Site, which is located entirely within Baltimore County, is a former shipyard. The route proposed for the Pipeline (Pipeline Route), which crosses all of the listed counties, includes industrial, commercial, agricultural, and residential lands. Together, the Terminal Site and the Pipeline Route comprise the Project Area.

7.2 Objective and Applicability

Resource Report 7, *Soils*, describes the soil resources present at the Sparrows Point LNG Terminal location and along the Pipeline Route, identifies potential impacts on soils, and mitigation methods to avoid or minimize potential impacts.

7.3 Soil Descriptions

Soil associations are groups of soils geographically associated in a characteristic repeating pattern. These associations have been defined and delineated as a single map unit. Each association is named for the predominant soil series that dominate the soil pattern, but includes soils of other series that occur with less frequency across the association. United States Department of Agriculture (USDA), Natural Resource Conservation Service (NRCS) soil surveys and databases were used to characterize the soils affected by the Sparrows Point

Project. The databases utilized included the State Soil Geographic (STATSGO) and Soil Survey Geographic (SSURGO) information.

7.3.1 Mid-Atlantic Express - Pipeline Facilities

Based on the STATSGO database, the soil associations traversed by the Pipeline are shown on Figure 7.3-1, and are summarized by characteristics as follows (along with associated Map Unit ID in parentheses):

- **Othello-Elkton-Mattapex (MD005):** This association consists of moderately well drained and poorly drained fine-silty, mixed soils that are nearly level or are gently sloping. These soils are deep and have moderately slow to slow permeability. Soil acidity is strongly acidic to extremely acidic unless limed.

- **Sunnyside-Christiana-Muirkirk (MD007):** This association consists of very deep, well drained to somewhat excessively drained, moderately slow to slowly permeable soils on uplands. These soils have slopes from zero to fifty percent and are well drained to somewhat excessively drained. Most of this association lies in wooded or idle fields.

- **Beltsville-Croom-Leonardtown (MD002):** This association consists of deep to very deep soils which range in drainage from poor to well drained and have variable permeability. These soils are found in Coastal Plains and uplands. Slopes range from nearly level to moderately sloping. Most of the association is not used as cropland and there is high erosion potential for much of this association.

- **Neshaminy-Lehigh-Glenelg (MD029):** Soils in this association are deep to very deep and well drained to somewhat poorly drained fine-loamy. Permeability is moderately slow to slow. This association ranges from forested and very stony to cultivated soils. Soils are nearly level to steep. Most of this association has high erosion potential.

- **Manor-Glenelg-Chester (MD011):** This association consists of deep to very deep, steep to gently sloping, somewhat excessively drained and well drained soils. This association occurs on hilly uplands. Most of this association has high erosion potential. Most of the soils are used for farming and a limited amount for pasture.

- **Chrome-Conowingo-Neshaminy (PA058):** Soils in this association are moderately deep to very deep, somewhat poorly drained to well drained soils. Much of this association has high erosion potential. This association consists of nearly level to moderately sloping soils in well dissected uplands. Much of this association is used for farming and pasture. Other areas are wooded or used for urban and suburban communities.

- **Chester-Glenelg-Manor (PA061):** This association consists of deep to very deep, gently sloping to steep soils. These soils are well drained to excessively drained. Most of the land area is used as cropland and to a limited extent, pasture. There is a high potential of erosion for approximately fifty percent of the association.

- **Hagerstown-Duffield-Clarksburg (PA066):** This association consists of deep and very deep, well drained soils with moderate permeability. Some areas are less well drained with slow to moderately slow permeability. These soils weathered mostly from limestone. Most of this association is used as cropland or pasture.

- **Edgemont-Highfield-Buchanan (PA086):** This association consists of deep and very deep, well drained soils. These soils formed from light colored rocks, notably quartzite. They have moderate to moderately rapid permeability. This association is located on sloping to steep hills, ridges, and valleys and can be stony. Land use is a mixture of wooded areas and cleared areas for crops and orchards.

The Pipeline crosses each of the six identified soil associations in Maryland and four of the identified soil associations in Pennsylvania. The locations of each soil association are summarized on Table 7.3-1.

7.3.2 Sparrows Point LNG Terminal – Aboveground Facilities

The Terminal Site is mapped in the STATSGO database as part of the Othello-Elkton-Mattapex Association, as shown on Figure 7.3-2. At a more detailed level, the SSUGRO database soil series information indicates the western portion of the Terminal Site (70% of the site, or 32 acres) is mapped as "made land" (which is generally coincident with the portion of the site mapped as "fill" as shown on Figure 6.3-1, Geologic Conditions) and the eastern portion (approximately 30% of the site, or 13 acres) is mapped as Mattapex-Urban land complex, 0-5 percent slopes (a series which is part of the above-referenced Othello-Elkton-Mattapex Association). This complex is defined as consisting of soils that have been graded, cut, filled or otherwise disturbed for non-farm uses.

There are no designated "prime farmlands" associated with the Terminal Site.

7.4 Construction and Operation Impacts

Based on the properties identified from the soil survey data, an assessment of potential impacts was conducted for the Sparrows Point Project, as summarized on Table 6.3-1, Geologic Conditions. This assessment included areas of highly-erodible soils, potential compaction susceptibility, potential shallow bedrock and potential for poor revegetation. Soils were evaluated relative to these potential limitations on the basis of selected characteristics (using reference information from the USDA publication "Understanding Soil Risks and Hazards – Using Soil Survey to Identify Areas with Risks and Hazards to Human Life and Property").

Modified construction and installation techniques, best management practices and engineering controls have been assembled into the Environmental Construction Plan ([ECP]; included as Appendix 2A to Resource Report 2) and Best Management Practices drawings ([BMPs]; included as Appendix 2B to Resource Report 2). The ECP and BMPs for the Sparrows Point Project indicate the measures to avoid or minimize impacts to soils during construction and operation, most specifically to soils in agricultural and residential areas. The specific locations of these areas are tabulated in Table 7.3-1.

7.4.1 Potential Soil Limitations

7.4.1.1 Soil Erosion Potential

Identifying soils susceptible to severe erosion by water or wind is dependent on relevant soil characteristics, climate, vegetation and topography. Soil erosion by water generally occurs to the greatest degree in areas of loose soils, particularly on un-vegetated moderate to steep slopes, and particularly during heavy rain events. Areas of severe wind-induced erosion generally occur in dry, fine textured, exposed (un-vegetated) soil deposits.

Given the nature of the climate, soils, vegetative cover and topography in the Project Area, the potential for erosion hazard has been identified by reviewing the SSUGRO-designated highly erodible soils. Highly erodible soils have a maximum potential for erosion that equals, or exceeds, eight times the tolerable erosion rate. These designations are based on the Revised Universal Soil Loss Equation (RUSLE) which relates the effects of rainfall, soil characteristics, and the length and steepness of slope to the soil's tolerable sheet and rill erosion rate. Sections of the Pipeline Route where the soil association crossed contains greater than 25% highly erodible soils, have been identified as such on Table 7.3-1. This accounts for approximately 70% of the pipeline alignment primarily in northern Baltimore County, Maryland and Harford County, Maryland. Specifically, these areas include the almost the entire Pipeline Route between mileposts MP 17.1 and MP 43.8, and several shorter sections between MP 44.4 and MP 83.4.

Methods used during construction to limit erosion potential shall include those discussed in the ECP Section IV, such as temporary slope breakers/diversion ditches, sediment barriers, and mulching. Permanent measures such as trench breakers and slope breakers/diversion ditches will also be employed.

7.4.1.2 Revegetation Potential

The revegetation potential of soils along the Pipeline Route was evaluated for on the basis of a general suitability rating to support habitat type growth as an indicator of the soil’s ability to sustain various types of plant growth. There were no areas within the soil associations crossed that indicated poor or very poor suitability to support plant growth (categories included grasses, grain and legumes, wild herbaceous upland plants, wetland food and cover plants, etc).

7.4.1.3 Potential for Shallow Bedrock

An evaluation of areas of potential shallow bedrock was completed for the Sparrows Point Project. Soil associations with greater than 25% of their soils makeup reported as having shallow bedrock (less than five feet) have been included as such on Table 7.3-1. This evaluation excluded mapped units that indicated soft rock (e.g., severely weathered rock or unlithified units) may be present. Approximately 30% of soil associations along the Pipeline Route have the potential for shallow bedrock. These areas represent soils in discontinuous sections mapped from mile-post MP 18 to MP 83.4. Further evaluation and discussion of areas of potential shallow bedrock and measures to avoid or

minimize potential impacts are presented in Resource Report 6, Geological Resources.

7.4.1.4 Compaction Potential

An evaluation of the soils with severe compaction potential was completed for the Project by identifying areas where there are poorly to very poorly-drained soils with greater than 30% clay content in the upper two feet of the soil strata. Compaction impacts are primarily related to packing, rutting or settling of the soils during construction or restoration activities. Two of the soil associations crossed by the Pipeline (Neshaminy-Lehigh-Glenelg, MD029 and Othello-Elkton-Mattapex, MD005) meet these defined characteristics for potential compaction susceptibility. Soil associations with greater than 25% of their soils makeup reported with compaction potential (as defined above) have been included as such on Table 7.3-1. The area of the Pipeline alignment where these soil conditions may be occur appears to be in discontinuous sections between MP 0 and MP 47.

Decompaction of soils during the restoration phase shall be performed to restore soil porosity and permeability. Restoration methods to mitigate should soil compaction occur during construction will include plowing areas where soil has been over-compacted during construction. Alternatively, planting and plowing under of a "green manure" crop may be performed if appropriate and acceptable to the landowner. Further details on measures to avoid or minimize potential impacts, or restoration measures in agricultural or residential areas are discussed below and expanded upon in the ECP and BMPs.

7.4.2 Cropland and Residential Impacts

Potential impacts to cropland and residential areas include loss of soil fertility (due to lack of topsoil separation during trenching and backfilling), damage from soil compaction (caused during construction or due to settling following restoration), inappropriate placement of rock material or vertical soils mixing (during backfilling), or interference/damage to drainage tile (ultimately disruption of drainage patterns) and irrigation systems. These potential impacts are generally related to areas of soil limitations outlined above and movement of construction vehicles, trenching and restoration activities.

Engineering controls and best management practices will be factored into the construction design to avoid or minimize potential impacts associated with construction, restoration and operation/maintenance.

More details on these controls and procedures are included in section 7.5 below, and in the ECP. Site-specific residential mitigation measures will also be implemented as necessary during the development of the Pipeline design. These mitigation measures are described in Resource Report 8, Land Use, Recreation and Aesthetics.

Additional potential impacts during construction and restoration activities in agricultural lands may include vertical mixing of soil horizons, damage to thin topsoil layers, and redistribution of coarser-grained sub-soils. Topsoil stripping and segregation will be conducted in agricultural lands prior to the start of trenching to minimize or avoid potential impacts associated with vertical mixing of soils, loss or

damage to thin topsoil layers, and coarse grained soils being introduced to the topsoil during restoration. Areas of shallow bedrock or large boulders may require special management/segregation of spoils to minimize or avoid potential impacts during restoration of the pipeline construction right-of-way in areas of residential or agricultural land use (e.g., management of excess rock material offsite).

7.5 Mitigation Efforts

The Sparrows Point Project will be constructed and operated in a manner to avoid or minimize soils impacts to the extent practicable and restore agricultural crop productivity to original or better conditions. Steps will be taken as indicated in the ECP, to avoid or minimize erosion impacts during construction and operation and, for agricultural or residential land usage, soil compaction or shallow bedrock impacts.

Inquiries were made with County soil conservation agencies and agricultural preservation boards as well as State Soil Conservation Services, Departments of Agriculture and Environmental Conservation in both Maryland and Pennsylvania. Information received from these agencies was reviewed and incorporated in the ECP.

Specific measures intended to avoid or minimize potential soil impacts detailed in the ECP include:

- Use of inspectors to monitor construction and restoration activities, including agricultural productivity levels;
- Topsoil segregation procedures in residential and agricultural areas;
- Removal of rock and boulders from spoils to prevent placement back into excavation;
- Minimization of the quantity and duration of soil exposure during construction;
- Installation and maintenance of effective erosion and sediment control measures during construction and as part of restoration;
- Re-establishment of vegetation, including re-seeding, as soon as practicable following final grading;
- Soil restoration activities, including topsoil replacement, decompaction of severely compacted soils, and seeding requirements, and, in areas of wet soils, evaluation of alternative construction methods to avoid potential compaction impacts; and,
- Avoidance or minimization of potential impacts to drainage tiles, with procedures for working with landowners and local agricultural agency staff to ensure the conveyances are repaired or replaced if they are damaged during construction.

Prior to the start of construction activities, AES will consult with local soil and water conservation offices to present and explain the mitigation measures implemented by the Federal Energy Regulatory Commission that are intended to avoid or minimize potential impacts to soils.

7.6 References

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8. United States Department of Agriculture – Natural Resource Conservation Service (NRCS) Soil Survey Geographic (SSURGO) database for Lancaster County, Pennsylvania, 2005.

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15. United States Department of Agriculture - Natural Resource Conservation Service website (http://www.nrcs.usda.gov/)

16. Soil Survey Staff, Natural Resources Conservation Service, National Soil Survey Handbook, title 430-VI, 2001 (Revised 2005).